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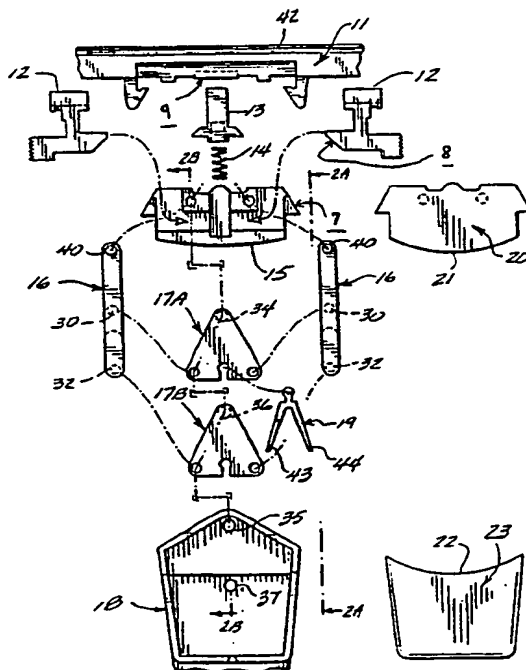
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁵ : B26B 21/24, 21/52</p>	<p>A1</p>	<p>(11) International Publication Number: WO 93/20983 (43) International Publication Date: 28 October 1993 (28.10.93)</p>
<p>(21) International Application Number: PCT/US93/03439 (22) International Filing Date: 12 April 1993 (12.04.93) (30) Priority data: 9208098.5 13 April 1992 (13.04.92) GB (71) Applicant (for all designated States except US): THE GILLETTE COMPANY [US/US]; Prudential Tower Building, Boston, MA 02199 (US). (72) Inventor; and (75) Inventor/Applicant (for US only) : OLDROYD, Brian [GB/GB]; 9 Rangewood Avenue, Reading, Berkshire RG3 3NN (GB). (74) Agents: GALLOWAY, Peter, D. et al.; Ladas & Parry, 26 West 61 Street, New York, NY 10023 (US).</p>		<p>(81) Designated States: CA, JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published With international search report.</p>

(54) Title: RAZOR WITH A MOVABLE CARTRIDGE



(57) Abstract

A razor includes a handle and a cartridge (11) pivotally mounted thereon by a cartridge carrier (15). A four-bar linkage comprising links (16) and a pair of bell cranks (17A, 17B) mounts the cartridge carrier (15) to the handle so that a centre of rotation of the cartridge is on or below a surface (42) to be shaved.

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RAZOR WITH A MOVABLE CARTRIDGE

This invention relates to a cartridge razor which includes a handle and a cartridge carrier mounted to the handle in a way which
5 allows the cartridge to rotate relative to the handle about an axis which is perpendicular to the edge of the or each blade of the cartridge and parallel to the surface to be shaved, thereby to accommodate changing contours of a
10 surface to be shaved.

Twin-blade cartridges which swivel about an axis parallel to the blade edges are well-known. Such swivelling improves contact between the blades and the surface being shaved,
15 and it has been found that the swivelling about the orthogonal axis improves blade contact, end to end. See GB-A-2116470 and GB-A-2172236.

Although the razor of GB-A-2116470 provides improved conformance with facial
20 contours, end to end of the shaving cartridge, there is scope for further improvement and it is one object of the present invention to achieve such an improvement. What is required is a way of mounting the cartridge to the handle which
25 allows the cartridge to move smoothly and with a minimum of friction about the axis perpendicular to the blade edge or edges, whenever there is a

- 2 -

change of the angle between the handle and the surface being shaved. Further, the mounting should be compact enough not to interfere unduly with the user's vision of the area being shaved, or with subsequent rinsing of the cartridge.

A cartridge razor of the type initially defined above, and in accordance with the present invention, is characterized in that the rotation perpendicular to the edge of the or each blade of the cartridge is about an axis of rotation which lies either on or below the said surface to be shaved.

By so locating the rotation centre, it is possible to establish a stable reaction to changing contours of the surface being shaved, which ensures that the end to end rocking movements of the cartridge do not involve any motion in the line of the blade edges relative to that surface.

Conventional swivelling movement parallel to the edge of the or each blade of the cartridge can be provided between a cartridge carrier and the cartridge. Preferably, the axis of rotation of the cartridge parallel to the blade edge(s) is also on or below the surface to be shaved. When the two orthogonal rotational axes intersect, the combination of the two swivel axes creates an effective universal joint on or below the surface being shaved.

The cartridge carrier can itself be carried on a four-bar linkage which lies in a plane parallel to the blade edges. A suitable four-bar linkage has first and second transverse links, each with a mid-point pivotally mounted to the handle, and two opposite ends each pivotally mounted to an extension link, itself mounted pivotally to the end of the cartridge

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carrier, so that each end of the carrier is supported by one of the extension links of the four-bar linkages.

Conveniently, each of the four-bar transverse links is a bell crank having an apex at its mid-point and cranked left hand and right hand limbs extending in opposite directions from the apex but subtending an angle of less than 180°, for example, 60°, so that the bell crank points, like an arrow head, towards the cartridge carrier. This is one effective way to move the centre of rotation of the carrier away from its mounting in the handle and towards the desired position on or behind the surface to be shaved.

A four-bar linkage as described immediately above has already been disclosed, see GB 1460732, but only as a pair of such linkages, to provide swivel motion about the axis parallel to the blade edges. The rotational axis is above the surface to be shaved.

Preferably, a biasing spring is provided, to urge the carrier to a start disposition so that during shaving whenever the cartridge is no longer subject to forces tending to rotate it about the rotational axis perpendicular to the blade edges, the biasing means will urge the carrier back to its start disposition. A preferred biasing spring is a resilient wishbone mounted at its apex to the said bell crank and with its limbs pressing against the two extension links.

For a better understanding of the invention, and to show more clearly how the same may be carried into effect, reference will now be made, by way of example, to the accompanying

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drawings, in which:

Figure 1 is a first elevation, exploded, to show various individual components of a preferred embodiment of razor in accordance
5 with the invention;

Figure 2A is an exploded side view of a portion of the linkage as seen along view line 2A - 2A of Figure 1;

Figure 2B is a longitudinal cross sectional view as taken along line 2B - 2B of Figure 1, the parts being shown in their assembled position;

Figure 3 is a front elevational view of the assembled razor with the cover plates
15 removed;

Figure 4 is a front elevational view similar to Figure 3 with the razor shown in a tilted position;

Figure 5 is a fragmentary elevational view showing the cartridge being retained by the carrier; and,

Figure 6 is a view similar to Figure 5 showing the cartridge released from the carrier.

Referring to Figure 1, a shaving
25 cartridge 11 is held by a pair of shell bearings 12, in a manner known per se, to the remainder of the razor system. A plunger 13 is mounted in the razor for endwise movement and a compression spring 14 acts on the plunger to urge it into
30 endwise pressure on a ramp surface 9 on the cartridge, thereby to urge the cartridge into a centered median disposition in the shell bearings 12, as is known per se. To change the
35 cartridge the shell bearings are squeezed together. Not only does this release the bearings but it also causes ramp surfaces 7, 8 to depress the plunger 13 against the action of

- 5 -

the spring 14, to release the cartridge 11 from the razor. This also is known per se.

A cartridge carrier 15 carries the shell bearings 12 and plunger 13. The carrier is itself mounted on a four-bar linkage parallel with the blade edges. The linkage comprises a pair of extension links 16, one on each side of each of a pair of bell cranks 17A, 17B. These cranks are themselves pivotally mounted to a planar area 18 of the razor handle. A resilient wishbone spring 19 is clipped on to the upper bell crank 17A so that its two legs press against the extension links 16 to centre the linkage. A plate 20 covers the carrier 15 and has an arcuate edge 21 which abuts a corresponding edge 22 on a cover plate 23 for the handle area 18. The arcs of the edges 21, 22 are centered on the centre of rotation of the cartridge carrier 15 so that, when the carrier 15 rocks to follow facial contours, there is relative movement between the edges 21 and 22. In the preferred embodiment this relative motion can be sliding movement.

Referring now to Figure 2A and 2B, the four-bar linkage is shown from the side so that only one of the extension links 16 is visible. Each such link 16 has an upper boss 30 to engage with the upper bell crank 17A and a lower boss 32 to engage with the lower crank 17B. At the apex of the upper crank 17A is a boss 34 which is carried in a bore 35 in the handle 18. At the apex of the lower crank 17B is a boss 36 which is carried in a bore 37.

Referring now to Figure 3, each extension link 16 is pivotally connected to the cartridge carrier 15 by a boss 40. The carrier 15 rocks about these two bosses 40 in a locus

- 6 -

which corresponds to a centre of rotation 41 which is determined by the geometry of the bell cranks 17A and 17B. It can be seen that the centre of rotation 41 is on the opposite side of the shaving surface 42 of the cartridge from the razor handle, that is, below the surface to be shaved.

Referring now to Figure 4, a 15° tilt about the centre of rotation 41 has the effect of pressing the left hand leg 43 of the wishbone 19 against the left hand link 16 and the resultant elastic deformation of the leg produces a force tending to restore the four-bar linkage to a central disposition. The other leg 44 provides the restoring force when the rotation is in the other direction. With rotation as shown in Fig. 4, the leg 44 simply moves out of contact with its adjacent extension link 16.

Figures 5 and 6 show how the cartridge is mounted and separated from the remainder of the razor. As is mentioned above, the construction and operation is in itself already known, as from the SENSOR (trademark) razor, sold by the present Applicant.

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C L A I M S

1. A cartridge razor which includes a handle (18) and a cartridge carrier (15) mounted to the handle in a way which allows the
5 cartridge mounted on the carrier to rotate relative to the handle, about an axis which is perpendicular to the edge of the or each blade of the cartridge and parallel to the surface to be shaved, with changing contours of a surface
10 to be shaved and characterized in that said rotation is about a centre of rotation (41) which lies either on or below the said surface to be shaved.
2. A razor as claimed in claim 1, wherein
15 the cartridge carrier is itself carried on a four-bar linkage (16, 17) which lies in a plane parallel to the blade edges.
3. A razor as claimed in claim 2, wherein the four-bar linkage includes first and second
20 transverse links (17), each with a mid-point pivotally mounted to the handle, and two opposite ends each pivotally mounted to an extension link (16) itself pivotally mounted to one end of the cartridge carrier.
- 25 4. A razor as claimed in claim 3, wherein the transverse links are bell cranks.
5. A razor as claimed in claim 1, wherein the cartridge is provided with a cover surface
30 (20) which moves with the carrier relative to the handle, the cover surface having an arcuate edge (21) which abuts a corresponding edge portion (22) of a surface (23) of the handle, for relative sliding movement between the said edges when the carrier moves relative to the
35 handle.
6. A razor as claimed in claim 1,

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including biasing means (19) to urge the carrier
to rotate to a start disposition as soon as the
carrier is no longer subject to any shaving
forces tending to displace the carrier from said
5 start disposition.

FIG-1

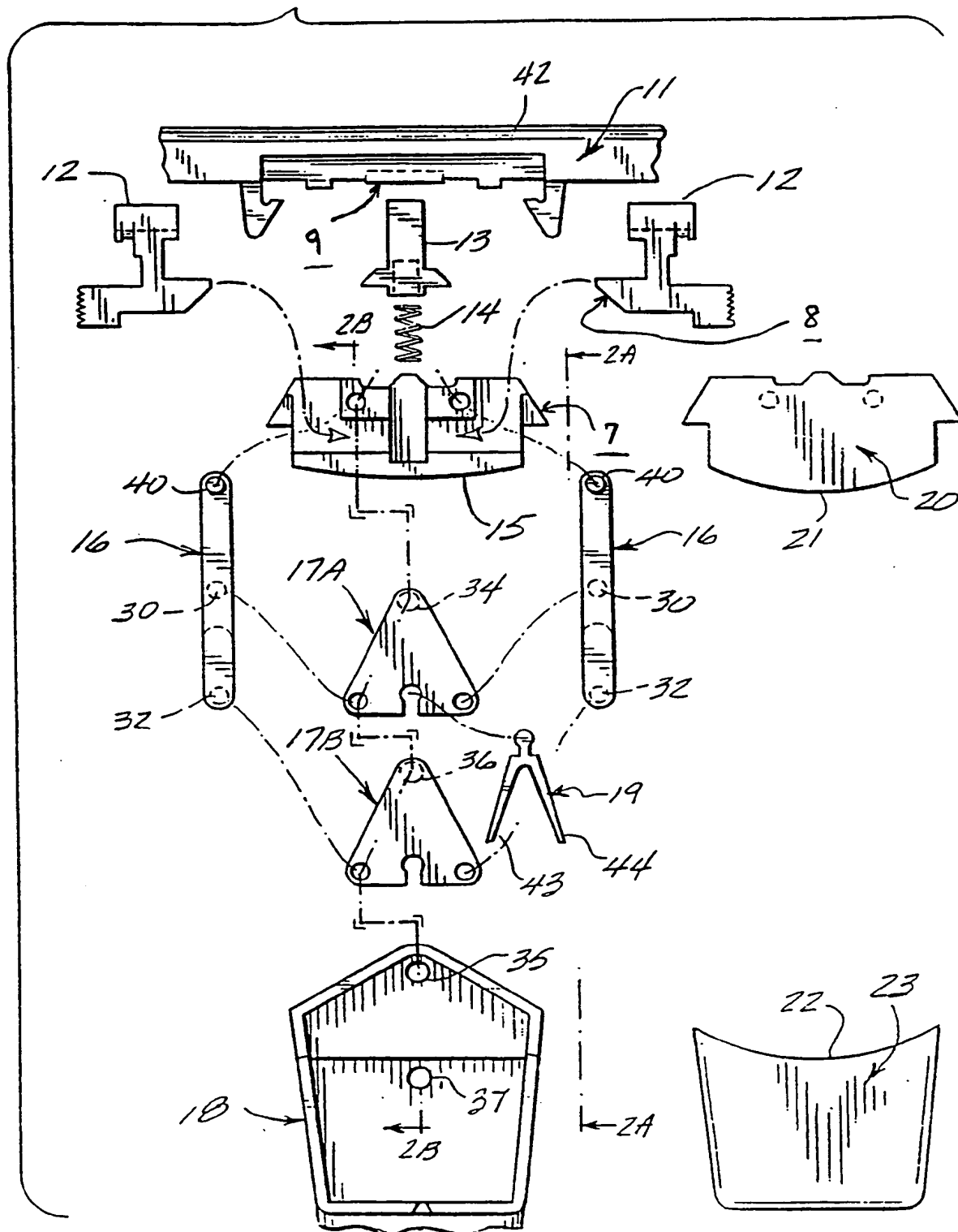


FIG-2A

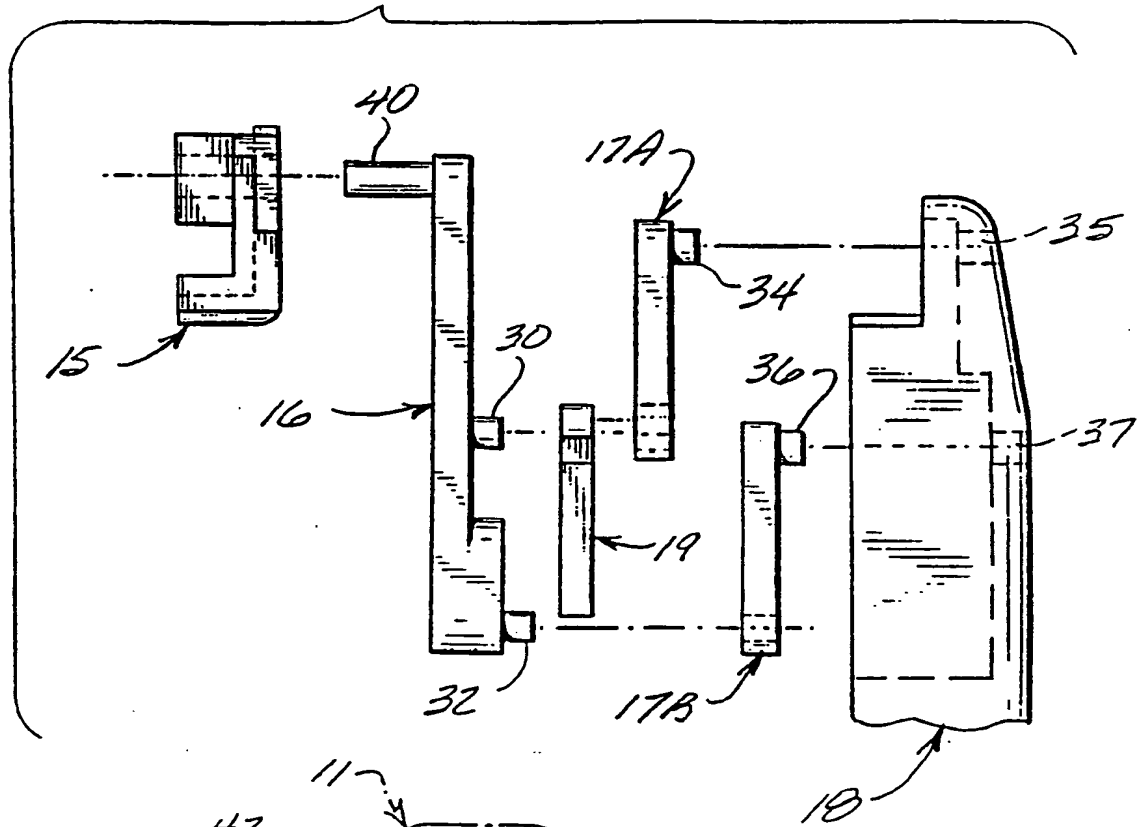


FIG-2B

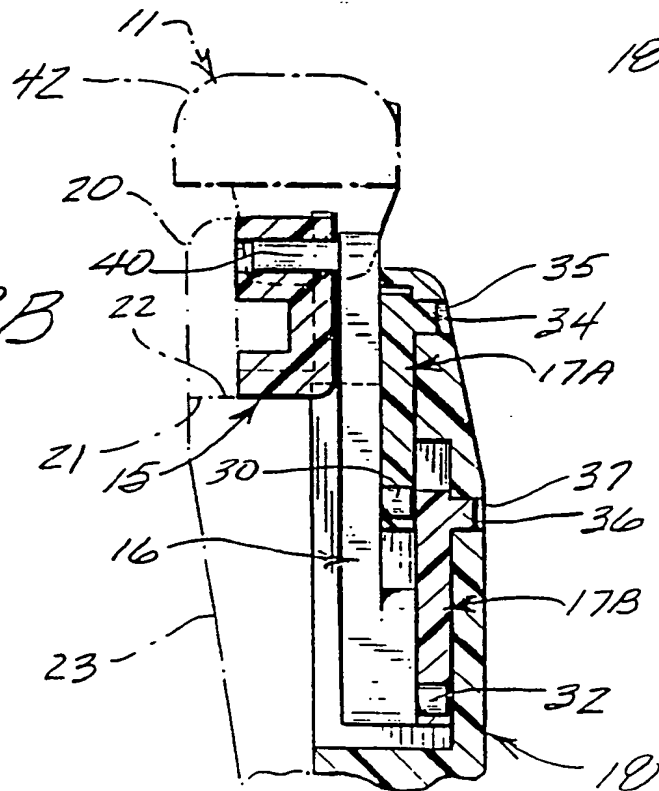


FIG-4

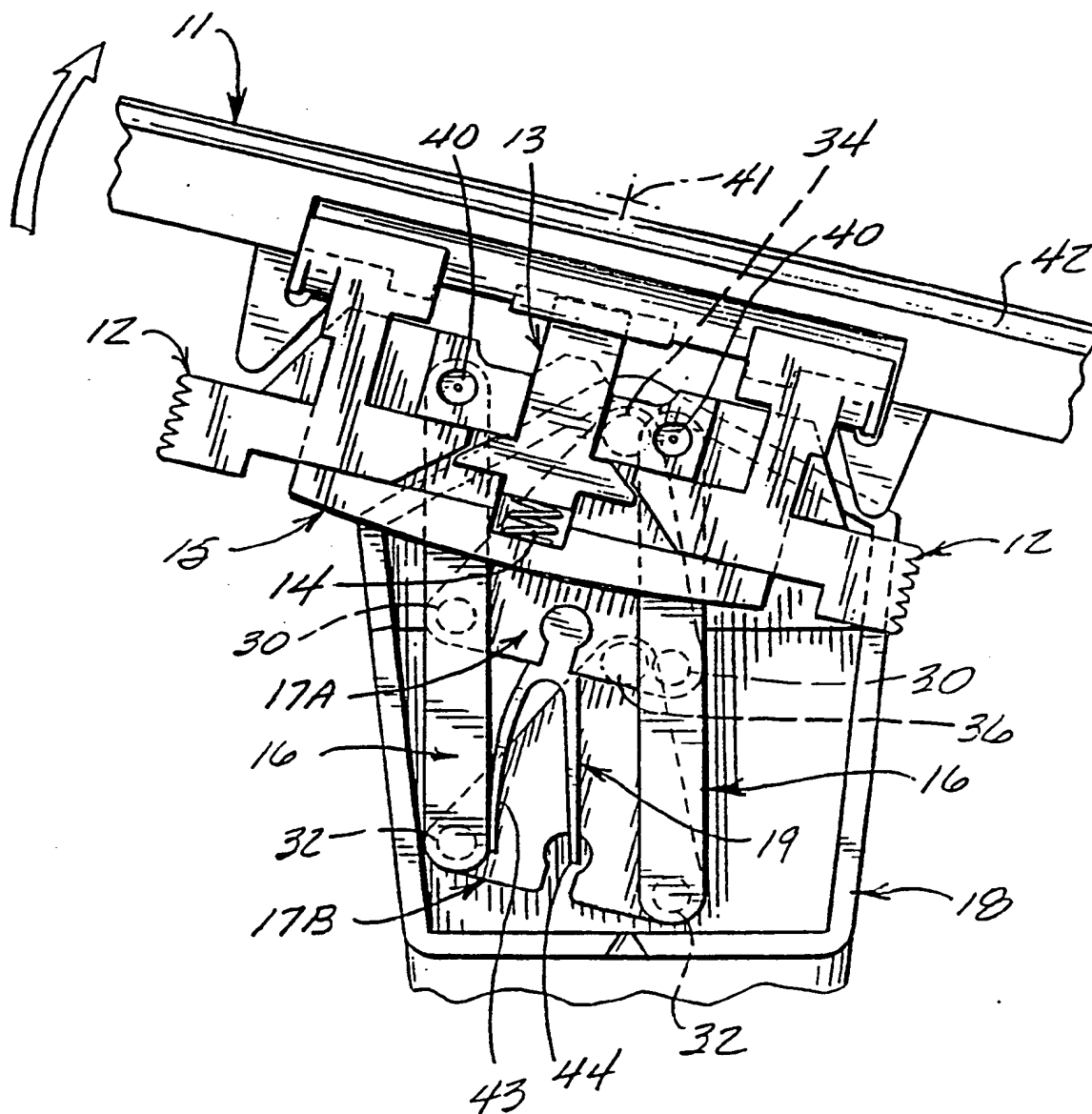


FIG-5

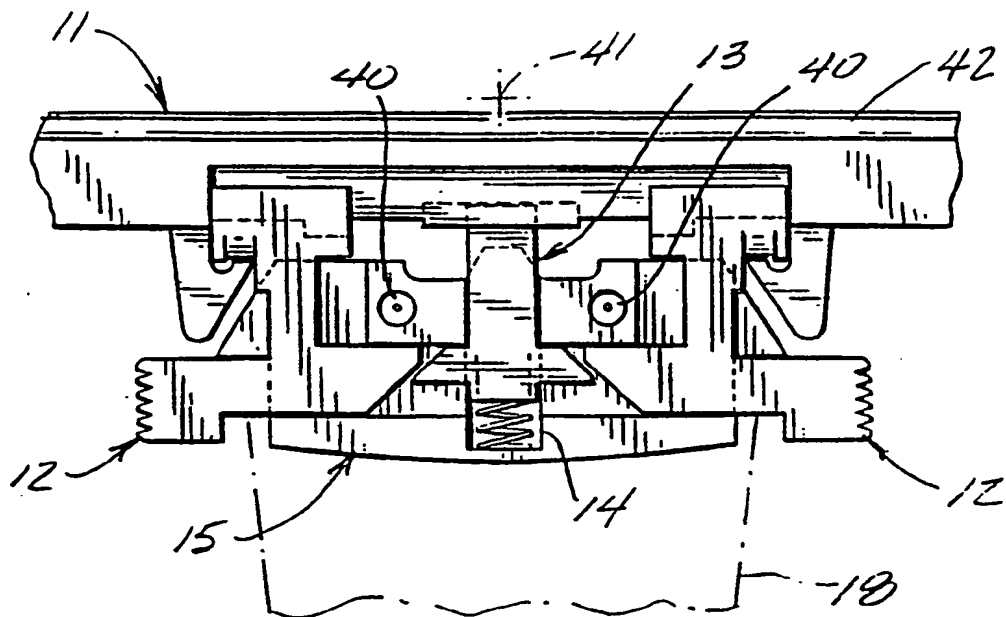
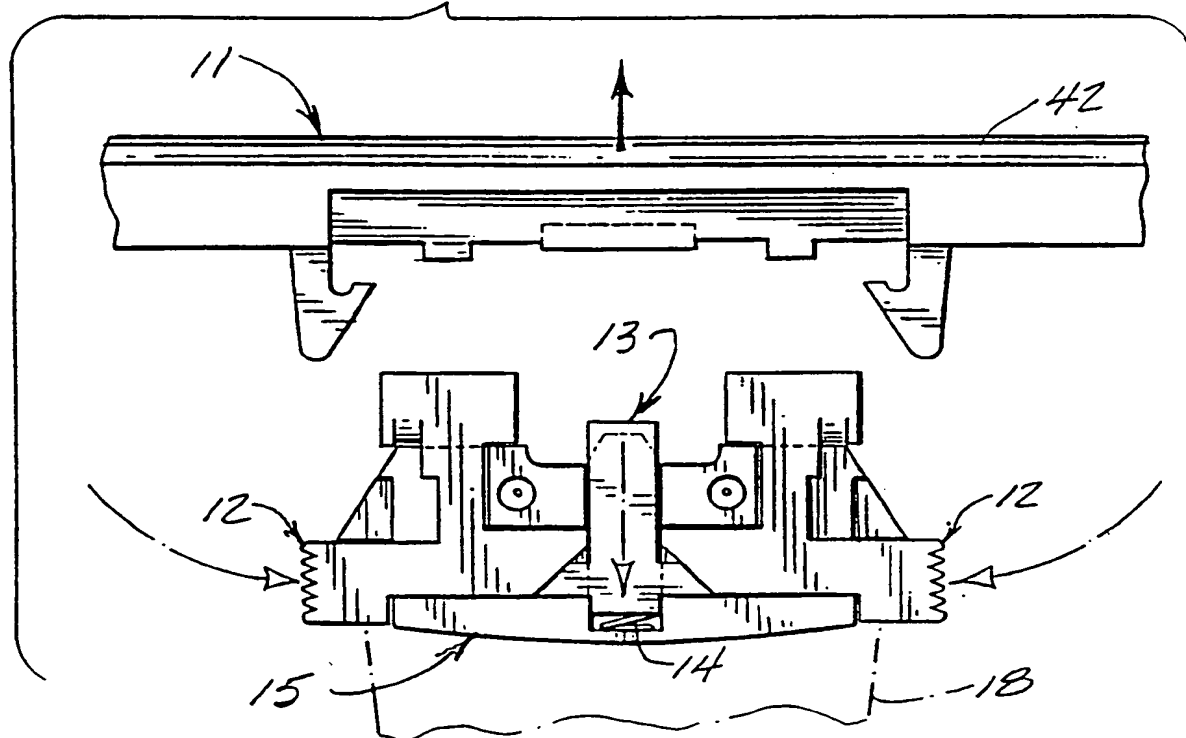


FIG-6



INTERNATIONAL SEARCH REPORT

 International application No.
 PCT/US93/03439

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :B26B 21/24, 21/52

US CL :30/89, 51, 87

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 30/89, 51, 87

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 4,756,082 (Apprille, Jr.) 12 July 1988, see Figures 1 and 4, col. 3, lines 7-14 and col. 4, lines 12-17.	1, 5, and 6
X	US, A, 3,935,639 (Terry et al.) 03 February 1976, see Figs. 2 and 3.	1, 5, and 6
A	US, A, 4,253,237 (Jacobson) 03 March 1981, see Figure 4.	1-6
A	US, A 4,573,266 (Jacobson) 04 March 1986, see Figure 10.	1-6

☐ Further documents are listed in the continuation of Box C.
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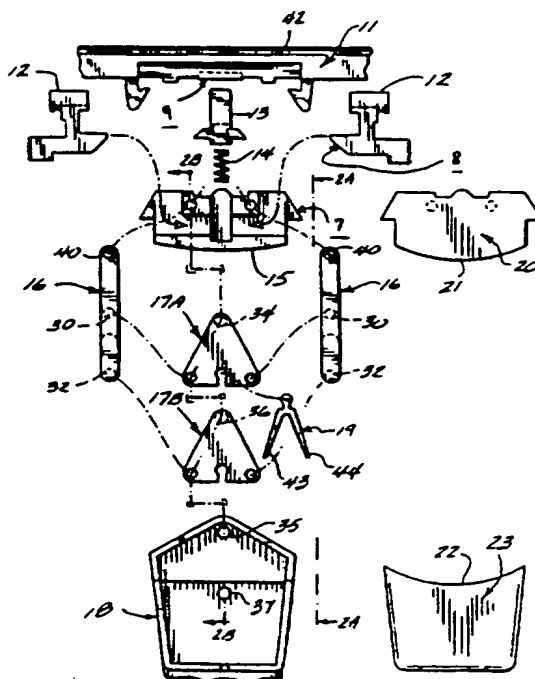
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<p>(21) International Application Number: PCT/US93/03439</p> <p>(22) International Filing Date: 12 April 1993 (12.04.93)</p> <p>(30) Priority data: 9208098.5 13 April 1992 (13.04.92) GB</p> <p>(71) Applicant (for all designated States except US): THE GILLETTE COMPANY [US/US]; Prudential Tower Building, Boston, MA 02199 (US).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): OLDROYD, Brian [GB/GB]; 9 Rangewood Avenue, Reading, Berkshire RG3 3NN (GB).</p> <p>(74) Agents: GALLOWAY, Peter, D. et al.; Ladas & Parry, 26 West 61 Street, New York, NY 10023 (US).</p>		<p>(81) Designated States: CA, JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published <i>With international search report.</i></p>

(54) Title: RAZOR WITH A MOVABLE CARTRIDGE



(57) Abstract

A razor includes a handle and a cartridge (11) pivotally mounted thereon by a cartridge carrier (15). A four-bar linkage comprising links (16) and a pair of bell cranks (17A, 17B) mounts the cartridge carrier (15) to the handle so that a centre of rotation of the cartridge is on or below a surface (42) to be shaved.

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RAZOR WITH A MOVABLE CARTRIDGE

This invention relates to a cartridge razor which includes a handle and a cartridge carrier mounted to the handle in a way which
5 allows the cartridge to rotate relative to the handle about an axis which is perpendicular to the edge of the or each blade of the cartridge and parallel to the surface to be shaved, thereby to accommodate changing contours of a
10 surface to be shaved.

Twin-blade cartridges which swivel about an axis parallel to the blade edges are well-known. Such swivelling improves contact between the blades and the surface being shaved,
15 and it has been found that the swivelling about the orthogonal axis improves blade contact, and to end. See GB-A-2116470 and GB-A-2172236.

Although the razor of GB-A-2116470 provides improved conformance with facial
20 contours, and to end of the shaving cartridge, there is scope for further improvement and it is one object of the present invention to achieve such an improvement. What is required is a way of mounting the cartridge to the handle which
25 allows the cartridge to move smoothly and with a minimum of friction about the axis perpendicular to the blade edge or edges, whenever there is a

- 2 -

change of the angle between the handle and the surface being shaved. Further, the mounting should be compact enough not to interfere unduly with the user's vision of the area being shaved, or with subsequent rinsing of the cartridge.

A cartridge razor of the type initially defined above, and in accordance with the present invention, is characterized in that the rotation perpendicular to the edge of the or each blade of the cartridge is about an axis of rotation which lies either on or below the said surface to be shaved.

By so locating the rotation centre, it is possible to establish a stable reaction to changing contours of the surface being shaved, which ensures that the end to end rocking movements of the cartridge do not involve any motion in the line of the blade edges relative to that surface.

Conventional swivelling movement parallel to the edge of the or each blade of the cartridge can be provided between a cartridge carrier and the cartridge. Preferably, the axis of rotation of the cartridge parallel to the blade edge(s) is also on or below the surface to be shaved. When the two orthogonal rotational axes intersect, the combination of the two swivel axes creates an effective universal joint on or below the surface being shaved.

The cartridge carrier can itself be carried on a four-bar linkage which lies in a plane parallel to the blade edges. A suitable four-bar linkage has first and second transverse links, each with a mid-point pivotally mounted to the handle, and two opposite ends each pivotally mounted to an extension link, itself mounted pivotally to the end of the cartridge

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carrier, so that each end of the carrier is supported by one of the extension links of the four-bar linkages.

Conveniently, each of the four-bar transverse links is a bell crank having an apex at its mid-point and cranked left hand and right hand limbs extending in opposite directions from the apex but subtending an angle of less than 180°, for example, 60°, so that the bell crank points, like an arrow head, towards the cartridge carrier. This is one effective way to move the centre of rotation of the carrier away from its mounting in the handle and towards the desired position on or behind the surface to be shaved.

A four-bar linkage as described immediately above has already been disclosed, see GB 1460732, but only as a pair of such linkages, to provide swivel motion about the axis parallel to the blade edges. The rotational axis is above the surface to be shaved.

Preferably, a biasing spring is provided, to urge the carrier to a start disposition so that during shaving whenever the cartridge is no longer subject to forces tending to rotate it about the rotational axis perpendicular to the blade edges, the biasing means will urge the carrier back to its start disposition. A preferred biasing spring is a resilient wishbone mounted at its apex to the said bell crank and with its limbs pressing against the two extension links.

For a better understanding of the invention, and to show more clearly how the same may be carried into effect, reference will now be made, by way of example, to the accompanying

- 4 -

drawings, in which:

Figure 1 is a first elevation, exploded, to show various individual components of a preferred embodiment of razor in accordance with the invention;

Figure 2A is an exploded side view of a portion of the linkage as seen along view line 2A - 2A of Figure 1;

Figure 2B is a longitudinal cross sectional view as taken along line 2B - 2B of Figure 1, the parts being shown in their assembled position;

Figure 3 is a front elevational view of the assembled razor with the cover plates removed;

Figure 4 is a front elevational view similar to Figure 3 with the razor shown in a tilted position;

Figure 5 is a fragmentary elevational view showing the cartridge being retained by the carrier; and,

Figure 6 is a view similar to Figure 5 showing the cartridge released from the carrier.

Referring to Figure 1, a shaving cartridge 11 is held by a pair of shell bearings 12, in a manner known per se, to the remainder of the razor system. A plunger 13 is mounted in the razor for endwise movement and a compression spring 14 acts on the plunger to urge it into endwise pressure on a ramp surface 9 on the cartridge, thereby to urge the cartridge into a centered median disposition in the shell bearings 12, as is known per se. To change the cartridge the shell bearings are squeezed together. Not only does this release the bearings but it also causes ramp surfaces 7, 8 to depress the plunger 13 against the action of

- 5 -

the spring 14, to release the cartridge 11 from the razor. This also is known per se.

A cartridge carrier 15 carries the shell bearings 12 and plunger 13. The carrier is itself mounted on a four-bar linkage parallel with the blade edges. The linkage comprises a pair of extension links 16, one on each side of each of a pair of bell cranks 17A, 17B. These cranks are themselves pivotally mounted to a planar area 18 of the razor handle. A resilient wishbone spring 19 is clipped on to the upper bell crank 17A so that its two legs press against the extension links 16 to centre the linkage. A plate 20 covers the carrier 15 and has an arcuate edge 21 which abuts a corresponding edge 22 on a cover plate 23 for the handle area 18. The arcs of the edges 21, 22 are centered on the centre of rotation of the cartridge carrier 15 so that, when the carrier 15 rocks to follow facial contours, there is relative movement between the edges 21 and 22. In the preferred embodiment this relative motion can be sliding movement.

Referring now to Figure 2A and 2B, the four-bar linkage is shown from the side so that only one of the extension links 16 is visible. Each such link 16 has an upper boss 30 to engage with the upper bell crank 17A and a lower boss 32 to engage with the lower crank 17B. At the apex of the upper crank 17A is a boss 34 which is carried in a bore 35 in the handle 18. At the apex of the lower crank 17B is a boss 36 which is carried in a bore 37.

Referring now to Figure 3, each extension link 16 is pivotally connected to the cartridge carrier 15 by a boss 40. The carrier 15 rocks about these two bosses 40 in a locus

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which corresponds to a centre of rotation 41 which is determined by the geometry of the bell cranks 17A and 17B. It can be seen that the centre of rotation 41 is on the opposite side of the shaving surface 42 of the cartridge from the razor handle, that is, below the surface to be shaved.

Referring now to Figure 4, a 15° tilt about the centre of rotation 41 has the effect of pressing the left hand leg 43 of the wishbone 19 against the left hand link 16 and the resultant elastic deformation of the leg produces a force tending to restore the four-bar linkage to a central disposition. The other leg 44 provides the restoring force when the rotation is in the other direction. With rotation as shown in Fig. 4, the leg 44 simply moves out of contact with its adjacent extension link 16.

Figures 5 and 6 show how the cartridge is mounted and separated from the remainder of the razor. As is mentioned above, the construction and operation is in itself already known, as from the SENSOR (trademark) razor, sold by the present Applicant.

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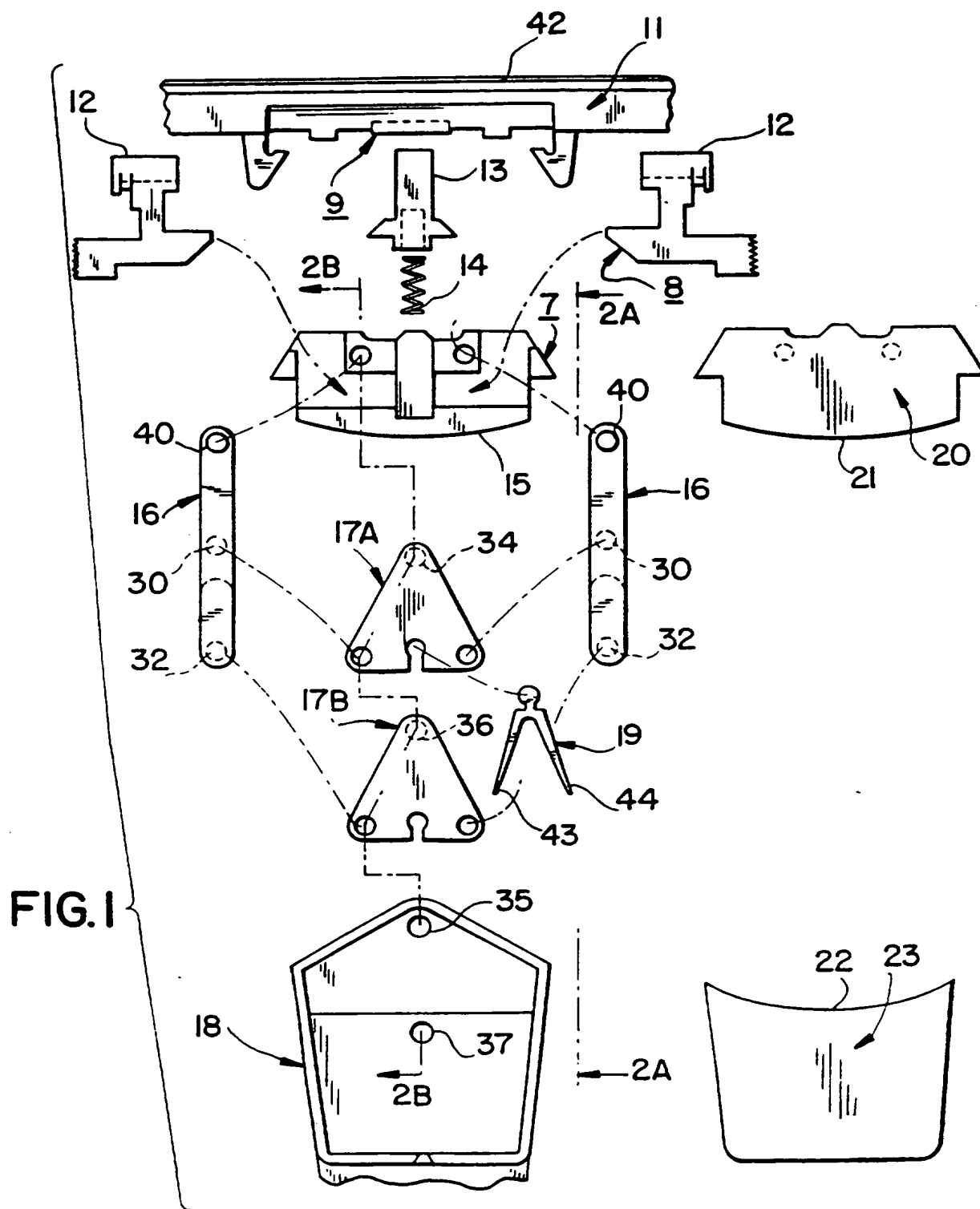
C L A I M S

1. A cartridge razor which includes a handle (18) and a cartridge carrier (15) mounted to the handle in a way which allows the cartridge mounted on the carrier to rotate relative to the handle, about an axis which is perpendicular to the edge of the or each blade of the cartridge and parallel to the surface to be shaved, with changing contours of a surface to be shaved and characterized in that said rotation is about a centre of rotation (41) which lies either on or below the said surface to be shaved.
2. A razor as claimed in claim 1, wherein the cartridge carrier is itself carried on a four-bar linkage (16, 17) which lies in a plane parallel to the blade edges.
3. A razor as claimed in claim 2, wherein the four-bar linkage includes first and second transverse links (17), each with a mid-point pivotally mounted to the handle, and two opposite ends each pivotally mounted to an extension link (16) itself pivotally mounted to one end of the cartridge carrier.
4. A razor as claimed in claim 3, wherein the transverse links are bell cranks.
5. A razor as claimed in claim 1, wherein the cartridge is provided with a cover surface (20) which moves with the carrier relative to the handle, the cover surface having an arcuate edge (21) which abuts a corresponding edge portion (22) of a surface (23) of the handle, for relative sliding movement between the said edges when the carrier moves relative to the handle.
6. A razor as claimed in claim 1,

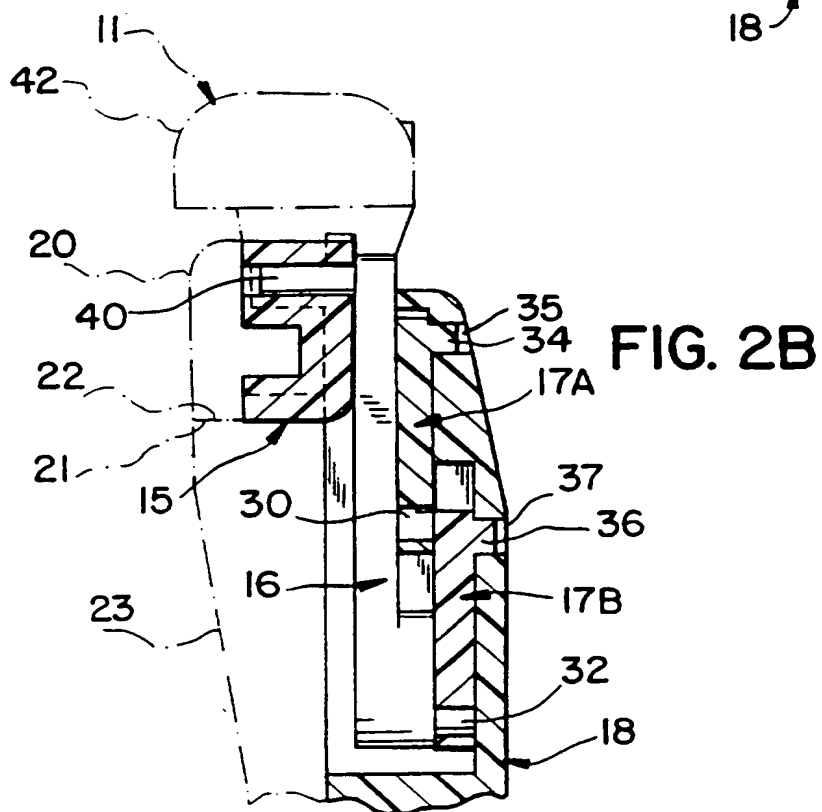
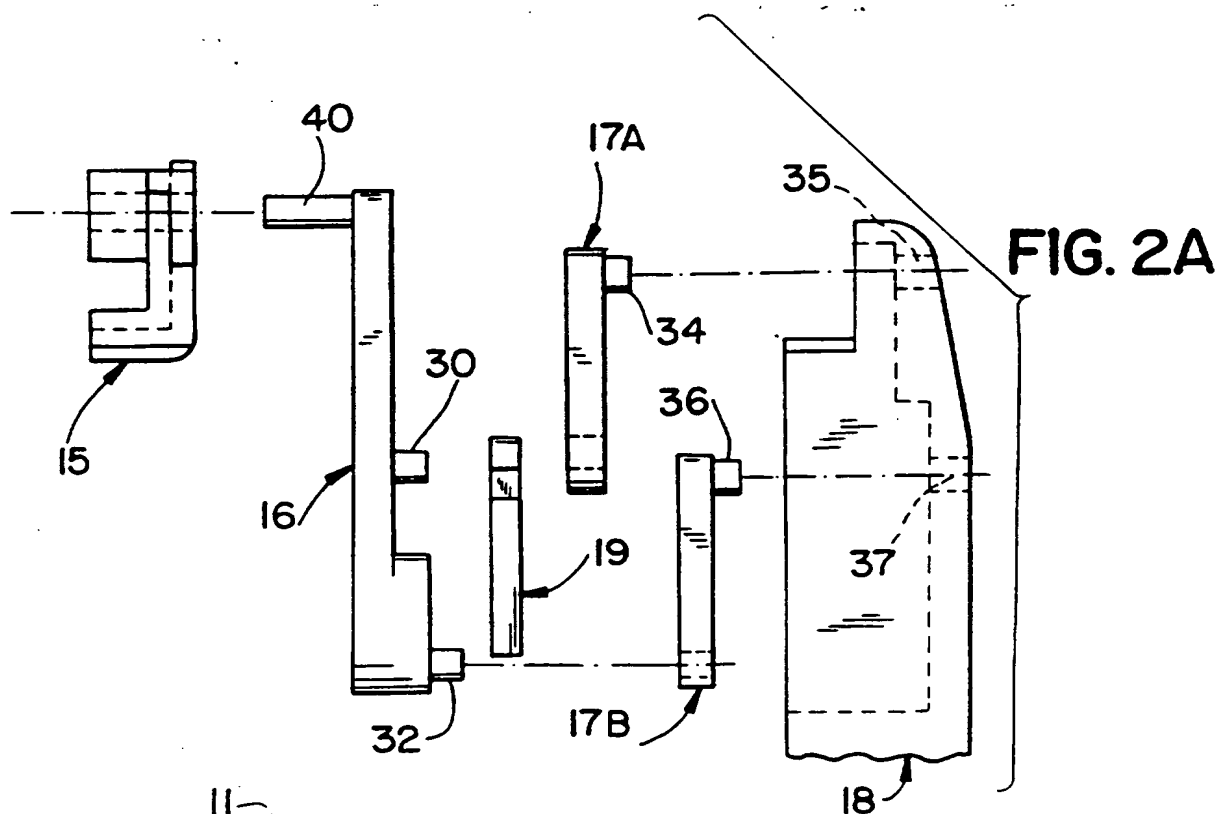
- 8 -

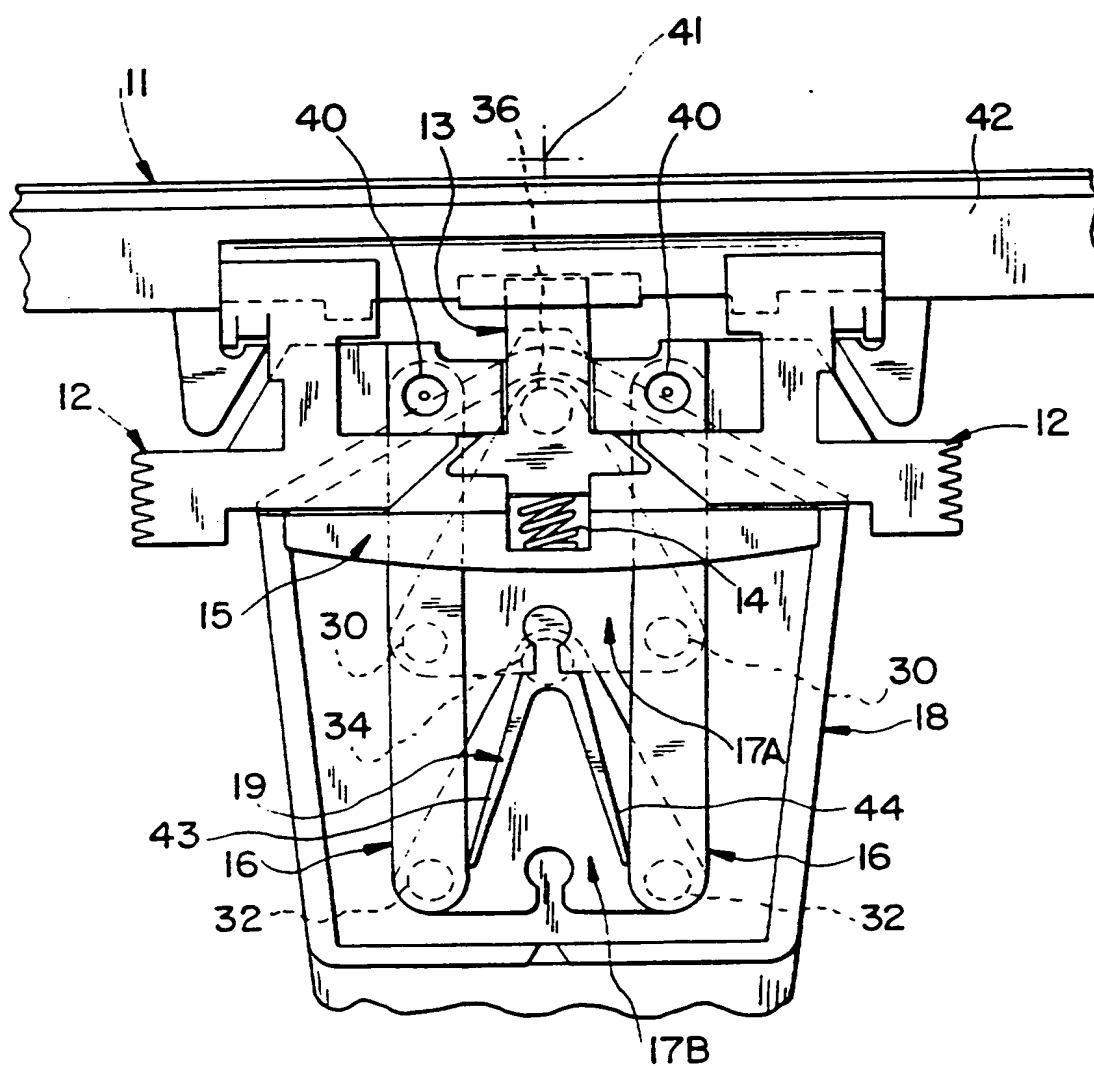
including biasing means (19) to urge the carrier
to rotate to a start disposition as soon as the
carrier is no longer subject to any shaving
forces tending to displace the carrier from said
5 start disposition.

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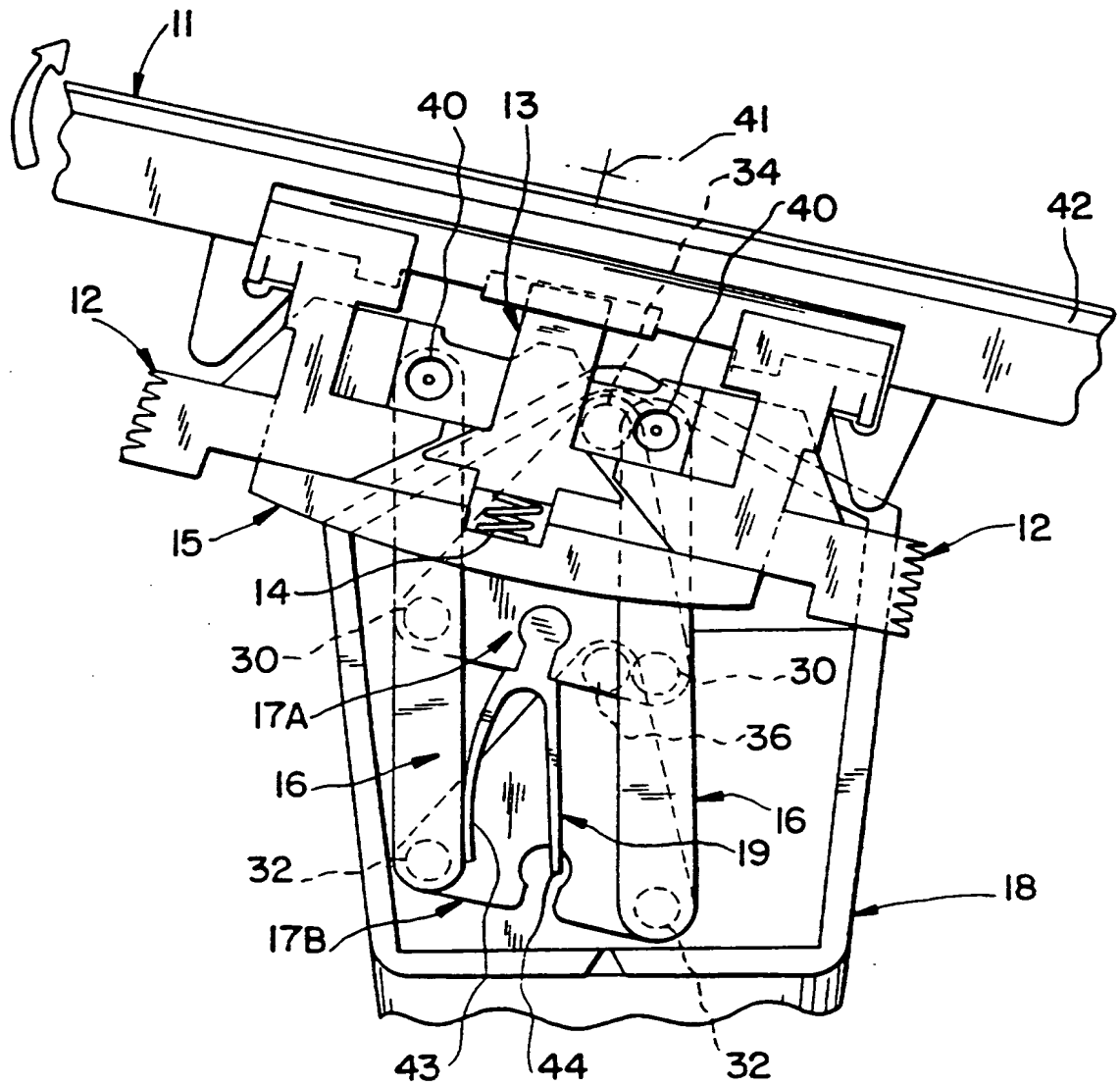


FIG. 4

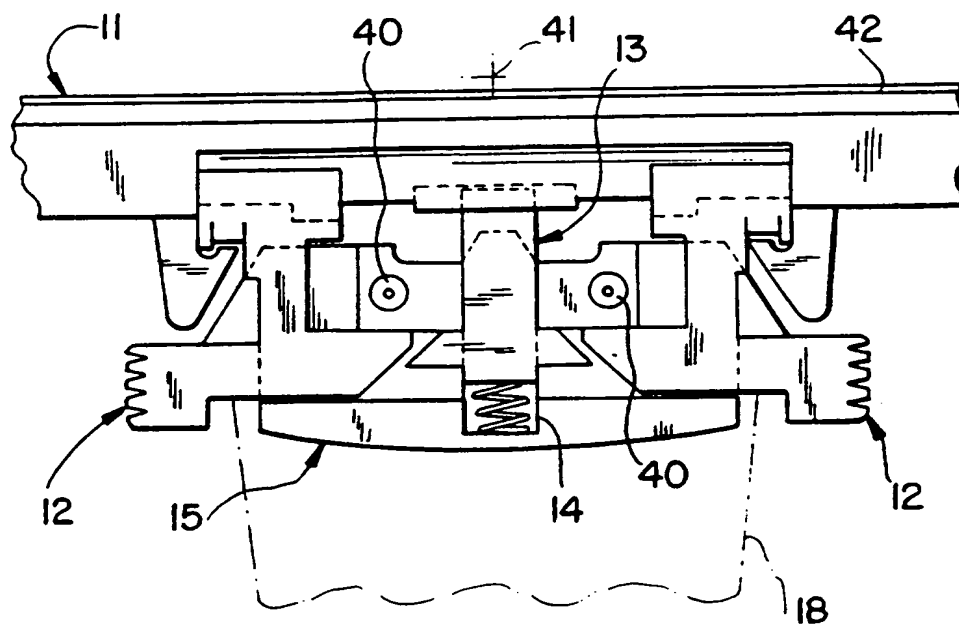


FIG. 5

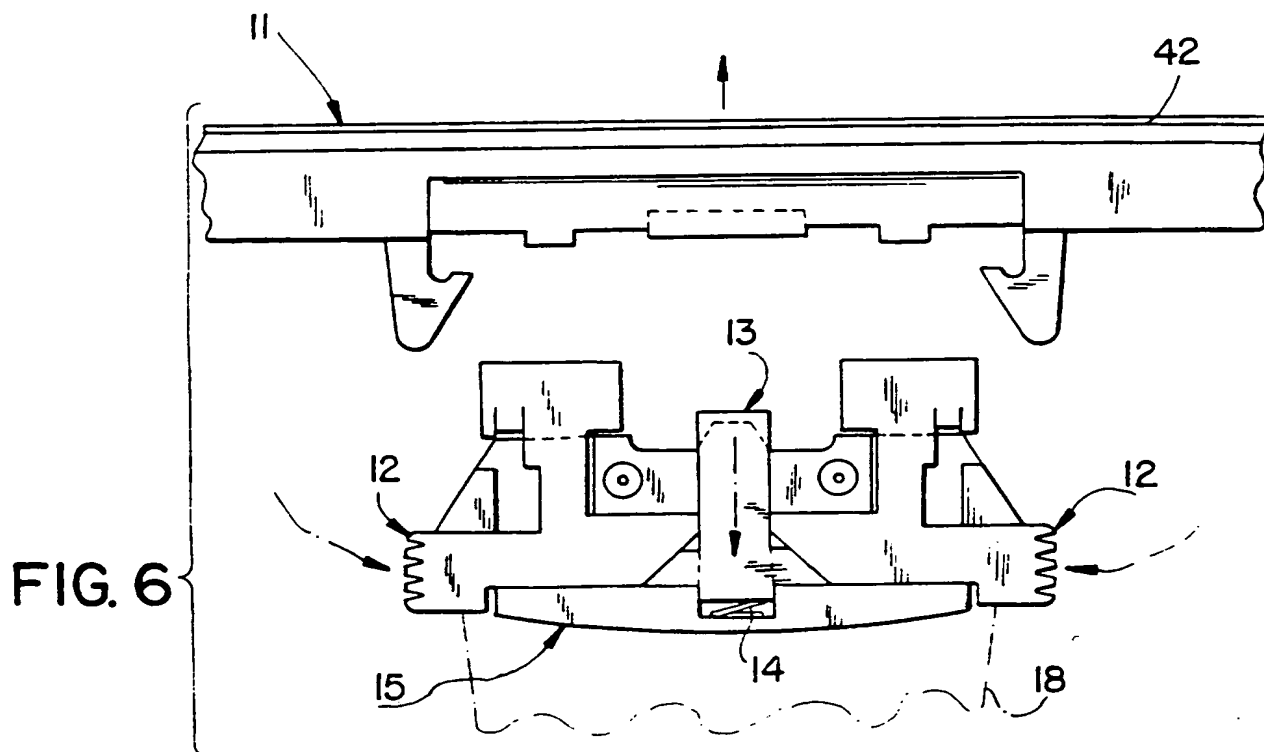


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US93/03439

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :B26B 21/24, 21/52

US CL :30/89, 51, 87

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 30/89, 51, 87

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 4,756,082 (Aprille, Jr.) 12 July 1988, see Figures 1 and 4, col. 3, lines 7-14 and col. 4, lines 12-17.	1, 5, and 6
X	US, A, 3,935,639 (Terry et al.) 03 February 1976, see Figs. 2 and 3.	1, 5, and 6
A	US, A, 4,253,237 (Jacobson) 03 March 1981, see Figure 4.	1-6
A	US, A 4,573,266 (Jacobson) 04 March 1986, see Figure 10.	1-6



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be part of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"A"	document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means		
"T" document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

01 July 1993

Date of mailing of the international search report

JUL 13 1993

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